

Copyright 2010 by The American Institute of Architects (AIA)

Exclusively published and distributed by Architectural Computer Services, Inc. (ARCOM) for the AIA

SECTION 211339 - FOAM-WATER SYSTEMS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

This Section is intended to be used with Section 211313 "Wet-Pipe Sprinkler Systems" or Section 211316 "Dry-Pipe Sprinkler Systems," which specifies sprinkler piping, valves, and valve specialties that make up a complete foam-water system.

- A. Section Includes:
 - 1. Concentrate piping and piping specialties.
 - 2. Bladder tanks and proportioning devices.
 - 3. Foam concentrate.
 - 4. Discharge devices.
 - 5. Monitoring and alarm devices.

1.3 DEFINITIONS

Retain definition(s) remaining after this Section has been edited.

- A. AFFF: Aqueous film-forming foam.
- B. AR-AFFF: Alcohol-resistant aqueous film-forming foam.

1.4 SYSTEM DESCRIPTION

Describe design criteria of foam-water system in this article. Paragraph below is a sample description of a basic system. Revise to suit Project.

- A. Description: Engineered, fixed, [wet-pipe] [dry-pipe] [preaction] [deluge], automatically actuated, low-expansion, [AR-]AFFF fire-extinguishing system for flammable-liquid fires. System includes diaphragm proportioning tanks and devices as described in NFPA 16.

1.5 PERFORMANCE REQUIREMENTS

- A. Standard Working Pressure of Piping-System Component: Listed for at least 175 psig (1200 kPa).
- B. Unless authorities having jurisdiction have stricter requirements, minimum design parameters are as follows:
1. Solution: [3] <Insert number> percent foam-water solution.
 2. Sprinkler Spacing: Maximum of [100 sq. ft. (9.5 sq. m)] <Insert area> per sprinkler, and maximum [12-foot (3.7-m)] <Insert dimension> spacing.
 3. Design Density: Minimum [0.16 gpm/sq. ft. (0.108 L/s per sq. m)].
 4. Foam Supply: Minimum [10] <Insert number>-minute discharge time.
 5. Water Supply: Minimum [60] <Insert number> minutes.
 6. Remote Area: Minimum [5000-sq. ft. (476-sq. m)] <Insert area> design area for closed-sprinkler systems. Open-sprinkler systems shall discharge over the entire system area.
 7. Sprinkler Temperature Rating: Maximum 250 to 300 deg F (121 to 149 deg C) at a roof or ceiling, and 135 to 170 deg F (57 to 77 deg C) for intermediate sprinklers.

Revise paragraph below to indicate specific loads determined by Project's structural engineer or see loads indicated on Drawings. Verify requirements of authorities having jurisdiction.

- C. Seismic Performance: Fire-suppression piping shall withstand the effects of earthquake motions determined according to NFPA 13.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:

Retain first subparagraph below if required by authorities having jurisdiction.

1. Piping, valves, fittings, and hangers.
2. Seismic restraints for all equipment.
3. Bladder tanks and proportioning devices.
4. Foam concentrate.
5. Discharge devices. Include flow characteristics.
6. Monitoring and alarm devices. Include electrical data and supervision method.
7. Foam-concentrate pumps. Include power supply and controller.
8. Foam-concentrate storage tanks.

9. Strainers.
 10. Test connections.
- B. Shop Drawings: For each hazard area, drawn to scale, and signed and sealed by a qualified professional engineer. Include plans, elevations, sections, details, and attachments to other work.
1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Retain first subparagraph below if equipment includes wiring.

2. Wiring Diagrams: For power, signal, and control wiring.
 3. Design Calculations: For amount of foam concentrate required for each hazard area.
 4. Plans: Show the following:
 - a. Foam-solution proportioning tanks and devices, piping, discharge devices, monitoring and alarm devices, and accessories.
 - b. Method of attaching hangers to building structure.
 - c. Fire-alarm panel.
 - d. Equipment and furnishings.
- C. Permit-Approved Drawings: Working plans prepared according to NFPA 16 and approved by authorities having jurisdiction. Include hydraulic calculations complying with NFPA 13.

1.7 INFORMATIONAL SUBMITTALS

Retain first paragraph below if retaining procedures for welder certification in "Quality Assurance" Article.

- A. Welding certificates.
- B. Field quality-control reports.

1.8 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For foam fire extinguishing to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
1. Valves and specialties.
 2. Bladder tanks and proportioning devices.
 3. Foam concentrate.
 4. Discharge devices. Include flow characteristics.
 5. Monitoring and alarm devices. Include supervision method.
 6. Foam-concentrate pumps. Include controller.
 7. Foam-concentrate storage tanks.
 8. Strainers.
 9. Test connections.

1.9 QUALITY ASSURANCE

Retain "Welding Qualifications" Paragraph below if shop or field welding is required. If retaining, also retain "Welding certificates" Paragraph in "Informational Submittals" Article.

- A. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Retain first paragraph below if FM-Approved components are required.

- C. FM Global Compliance: Provide components that are FM Approved and that are listed in FM's "Approval Guide."
- D. UL Compliance: Provide equipment listed in UL's "Fire Protection Equipment Directory."

1.10 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Discharge Devices: Not less than 20 percent of amount of each type installed.
 - 2. Foam Concentrate: Not less than 200 percent of amount installed.

PART 2 - PRODUCTS

2.1 CONCENTRATE PIPING MATERIALS

- A. Comply with requirements specified in Section 211313 "Wet-Pipe Sprinkler Systems" or Section 211316 "Dry-Pipe Sprinkler Systems" for pipes, fittings, joining materials, and valves.

Retain one of three paragraphs below. Schedule 40, black steel piping can be used with AFFF. Some concentrate manufacturers recommend brass or stainless-steel pipe with AR-AFFF.

- B. Schedule 40, Black Steel Pipe: ASTM A 53/A 53M, [**Type E**] <Insert type>, [**Grade B**] <Insert grade> or ASTM A 795/A 795M, [**Type E**] <Insert type>. Pipe ends may be factory or field formed to match joining method.
 - 1. Gray Iron Threaded Fittings, Classes 125 and 250: ASME B16.4.
 - 2. Gray Iron Pipe Flanges and Flanged Fittings: ASME B16.1.
 - 3. Malleable Iron Threaded Fittings, Classes 150 and 300: ASME B16.3.
- C. Stainless-Steel Pipe: ASTM A 312/A 312M, Schedule 40, [**Grade 304**] [or] [**Grade 316**], with factory-formed threaded or beveled ends; ASTM A 376/A 376M for seamless pipe; or ASTM A 213/A 213M, ASTM A 249/A 249M, and ASTM A 269 for seamless and welded tubing.

1. Class 150 Threaded Fittings: ASME B16.3 and MSS SP 114.
2. Butt-Weld Fittings: ASTM A 403/A 403M.
3. Flanges, Forged Fittings and Flanges, and Socket-Weld Fittings: ASTM A 182/A 182M.
4. Bar Stock and Compression Fittings: ASTM A 276 and ASTM A 479/A 479M.

D. Red Brass Pipe: ASTM B 43, Schedule 40, with factory- or field-formed threaded ends.

1. Threaded Fittings: ASME B16.11.

2.2 VALVES

A. General Valve Requirements:

1. UL listed or FM Approved for use in fire-protection systems.
2. Compatible with type of foam concentrate used.

B. Ball Valves:

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. Retain one of first two subparagraphs and list of manufacturers below. See Section 016000 "Product Requirements."

1. Manufacturers: Subject to compliance with requirements, **[provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

Retain option in first subparagraph below if manufacturer's name and model number are indicated in schedules or plans on Drawings; delete option and insert manufacturer's name and model number if not included on Drawings.

2. \$L~Basis-of-Design Product~\$l~1574~L\$: Subject to compliance with requirements, provide **[product indicated on Drawings] <Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. \$M~Anvil International~\$m~123456817454~M\$.
 - b. \$M~Crane Co.; Crane Valve Group; Stockham Division~\$m~123456817456~M\$.
 - c. \$M~Milwaukee Valve Company~\$m~123456817457~M\$.
 - d. \$M~NIBCO INC~\$m~123456817458~M\$.
 - e. \$M~Victaulic Company~\$m~123456817459~M\$.
 - f. \$M~Watts Water Technologies, Inc~\$m~123456817461~M\$.
 - g. **<Insert manufacturer's name>**.
3. Description:
 - a. Standard: UL 258.
 - b. For trim and drain functions.
 - c. Valves NPS 1-1/2 (DN 40) and Smaller: Bronze body with threaded ends.
 - d. Valves NPS 2 and NPS 2-1/2 (DN 50 and DN 65): Bronze body with threaded ends or ductile-iron body with grooved ends.
 - e. Valves NPS 3 (DN 80): Ductile-iron body with grooved ends.

C. OS&Y Gate Valves:

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. Retain one of first two subparagraphs and list of manufacturers below. See Section 016000 "Product Requirements."

1. Manufacturers: Subject to compliance with requirements, **[provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

Retain option in first subparagraph below if manufacturer's name and model number are indicated in schedules or plans on Drawings; delete option and insert manufacturer's name and model number if not included on Drawings.

2. \$L~Basis-of-Design Product~\$l~1576~L\$: Subject to compliance with requirements, provide **[product indicated on Drawings] <Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. \$M~Crane Co.; Crane Valve Group; Crane Valves~\$m~123456817466~M\$.
 - b. \$M~Crane Co.; Crane Valve Group; Stockham Division~\$m~123456817469~M\$.
 - c. \$M~Milwaukee Valve Company~\$m~123456817470~M\$.
 - d. \$M~NIBCO INC~\$m~123456817472~M\$.
 - e. \$M~United Brass Works, Inc~\$m~123456817473~M\$.
 - f. \$M~Watts Water Technologies, Inc~\$m~123456817474~M\$.
 - g. **<Insert manufacturer's name>**.
3. Description:
 - a. Standard: UL 262.
 - b. Accessories: Pregrooved stem for mounting tamper switch for monitoring by fire-alarm panel.
 - c. Body Material: Cast or ductile iron.
 - d. Ends: Flanged or mechanical.
 - e. Packing: Asbestos free.

D. Indicating-Type Butterfly Valves:

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. Retain one of first two subparagraphs and list of manufacturers below. See Section 016000 "Product Requirements."

1. Manufacturers: Subject to compliance with requirements, **[provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

Retain option in first subparagraph below if manufacturer's name and model number are indicated in schedules or plans on Drawings; delete option and insert manufacturer's name and model number if not included on Drawings.

2. \$L~Basis-of-Design Product~\$l~1577~L\$: Subject to compliance with requirements, provide **[product indicated on Drawings] <Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. \$M~Anvil International~\$m~123456817475~M\$.
 - b. \$M~Fivalco Inc~\$m~123456817477~M\$.
 - c. \$M~Kennedy Valve; a division of McWane, Inc~\$m~123456817478~M\$.

- d. \$M~Milwaukee Valve Company~\$m~123456817479~M\$.
- e. \$M~NIBCO INC.~\$m~123456817480~M\$
- f. \$M~Shurjoint Piping Products~\$m~123456817482~M\$.
- g. \$M~Tyco Fire Products LP~\$m~123456817483~M\$.
- h. \$M~Victaulic Company~\$m~123456817484~M\$.
- i. <Insert manufacturer's name>.

3. Description:

- a. Standard: UL 1091.
- b. Pressure Rating: 175 psig (1200 kPa) minimum.
- c. Valves NPS 2 (DN 50) and Smaller:
 - 1) Body Material: Bronze.
 - 2) End Connections: Threaded.
- d. Valves NPS 2-1/2 (DN 65) and Larger:
 - 1) Body Material: Cast or ductile iron.
 - 2) End Connections: Flanged, grooved, or wafer.
 - 3) Ends: Flanged or mechanical.
- e. Accessories: Tamper switch for monitoring by fire-alarm panel.

E. Swing Check Valves:

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. Retain one of first two subparagraphs and list of manufacturers below. See Section 016000 "Product Requirements."

1. Manufacturers: Subject to compliance with requirements, **[provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

Retain option in first subparagraph below if manufacturer's name and model number are indicated in schedules or plans on Drawings; delete option and insert manufacturer's name and model number if not included on Drawings.

2. \$L~Basis-of-Design Product~\$l~1581~L\$: Subject to compliance with requirements, provide **[product indicated on Drawings] <Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
- a. \$M~Anvil International~\$m~123456817487~M\$.
 - b. \$M~Clow Valve Company; a division of McWane, Inc~\$m~123456817489~M\$.
 - c. \$M~Crane Co.; Crane Valve Group; Crane Valves~\$m~123456817492~M\$.
 - d. \$M~Crane Co.; Crane Valve Group; Jenkins Valves~\$m~123456817494~M\$.
 - e. \$M~Crane Co.; Crane Valve Group; Stockham Division~\$m~123456817496~M\$.
 - f. \$M~Fire-End & Croker Corporation~\$m~123456817498~M\$.
 - g. \$M~Fire Protection Products, Inc~\$m~123456817500~M\$.
 - h. \$M~Globe Fire Sprinkler Corporation~\$m~123456817501~M\$.
 - i. \$M~Kennedy Valve; a division of McWane, Inc~\$m~123456817503~M\$.
 - j. \$M~Kidde Fire Fighting; a UTC business unit~\$m~123456817504~M\$.
 - k. \$M~Milwaukee Valve Company~\$m~123456817505~M\$.

- l. \$M~Mueller Co. Ltd.; Water Products Division~\$m~123456817509~M\$.
- m. \$M~NIBCO INC~\$m~123456817510~M\$.
- n. \$M~Potter Roemer; a division of Acorn Engineering Company~\$m~123456817512~M\$.
- o. \$M~Reliable Automatic Sprinkler Co., Inc. (The)~\$m~123456817515~M\$.
- p. \$M~Tyco Fire Products LP~\$m~123456817520~M\$.
- q. \$M~United Brass Works, Inc~\$m~123456817522~M\$.
- r. \$M~Victaulic Company~\$m~123456817527~M\$.
- s. \$M~Viking Group Inc~\$m~123456817529~M\$.
- t. \$M~Waterous Company~\$m~123456817530~M\$.
- u. \$M~Watts Water Technologies, Inc~\$m~123456817532~M\$.
- v. <Insert manufacturer's name>.

3. Description:

- a. Standard: UL 312.
- b. Pressure Rating: [**250 psig (1725 kPa) minimum**] [**300 psig (2070 kPa)**].
- c. Body Material: Cast iron.
- d. End Connections: Flanged or grooved.

F. Trim and Drain Valves:

1. General Requirements:

- a. Compatible with type of foam concentrate used.
- b. Pressure Rating: 175 psig (1200 kPa) minimum.

2. Angle Valves:

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. Retain first subparagraph and list of manufacturers below. See Section 016000 "Product Requirements."

- a. \$L~Manufacturers~\$l~1584~L\$: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - 1) \$M~Fire Protection Products, Inc~\$m~123456817533~M\$.
 - 2) \$M~United Brass Works, Inc~\$m~123456817534~M\$.
 - 3) <Insert manufacturer's name>.

3. Globe Valves:

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. Retain first subparagraph and list of manufacturers below. See Section 016000 "Product Requirements."

- a. \$L~Manufacturers~\$l~1588~L\$: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

- 1) \$M~Fire Protection Products, Inc~\$m~123456817536~M\$.
- 2) \$M~United Brass Works, Inc~\$m~123456817537~M\$.
- 3) <Insert manufacturer's name>.

4. Plug Valves:

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. Retain subparagraph and list of manufacturers below. See Section 016000 "Product Requirements."

- a. \$L~Manufacturers:~\$l~1589~L\$ Subject to compliance with requirements, **[provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**
 - 1) \$M~Southern Manufacturing Group~\$m~123456817538~M\$.
 - 2) <Insert manufacturer's name>.

2.3 SPECIALTIES

See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers. Retain one of first two paragraphs and list of manufacturers below. See Section 016000 "Product Requirements."

- A. Manufacturers: Subject to compliance with requirements, **[provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:**

Retain option in first paragraph below if manufacturer's name and model number are indicated in schedules or plans on Drawings; delete option and insert manufacturer's name and model number if not included on Drawings.

- B. \$L~Basis-of-Design Product~\$l~1592~L\$: Subject to compliance with requirements, provide **[product indicated on Drawings] <Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 1. \$M~Ansul Incorporated~\$m~123456817541~M\$.
 2. \$M~Chemguard Inc~\$m~123456817542~M\$.
 3. \$M~National Foam; part of the Kidde Fire Fighting organization~\$m~123456817544~M\$.
 4. \$M~Viking Group Inc~\$m~123456817546~M\$.
 5. <Insert manufacturer's name>.
- C. Specialties shall comply with NFPA 16, be compatible with the foam concentrate, and be designed to be drained and cleaned.

Retain one of two "Foam-Concentrate Storage Tanks" paragraphs below. Show tank capacity on Drawings.

- D. Foam-Concentrate Storage Tanks: Buna-N, bladder-type proportioning tank complying with UL 162 and ASME Boiler and Pressure Vessel Code: Section VIII; designed for use with

foam-concentrate pumps and for specific type of foam concentrate used. Include bladder, internal piping, fill and drain, glass sight gage, piping, and valves. Contain concentrate in the bladder.

1. Orientation: [**Horizontal design with saddle**] [**Vertical design with skirt**] support.
- E. Foam-Concentrate Storage Tanks: Atmospheric type, complying with UL 162 and ASME Boiler and Pressure Vessel Code: Section VIII; designed for use with foam-concentrate pumps and for specific type of foam concentrate used. Include pressure-vacuum vent, fill and drain, glass sight gage, piping, and valves.
- F. Foam-Concentrate Pumps: Listed for use in foam-water systems according to NFPA 20. Include supply side pressure relief valve and drain cock or valve.
- G. Proportioning Controllers: Venturi type complying with UL 162 and of capacity to match design at minimum and maximum flow.
- H. Concentrate Control Valves: Water-operated ball or deluge valve designed to open with flow through the proportioning controller.
- I. Concentrate Strainers: Bronze body and stainless-steel mesh strainer with minimum 0.125-inch (3.2-mm) perforations to remove solids that would block system components.
- J. Pressure Gages: Comply with UL 393; with 3-1/2-inch (90-mm) minimum-diameter dial, 0- to 300-psig (0- to 2070-kPa) dial range, and caption "WATER" or "CONCENTRATE" on dial face.

2.4 FOAM CONCENTRATE

- A. Description: [**AR-**]AFFF liquid concentrate, complying with NFPA 11 and UL 162, for making foam-water fire-extinguishing foam solution.

2.5 DISCHARGE DEVICES

- A. Discharge devices shall be UL listed or FM Approved.

In first paragraph below, retain closed, non-air-aspirating type sprinklers for wet-pipe, dry-pipe, and preaction systems; retain open, non-air-aspirating or air-aspirating type sprinklers for deluge systems.
--

- B. Sprinklers: [**Closed,**] [**Open,**] [**non-**]air-aspirating type; UL listed or FM Approved and listed for use with type of foam concentrate used.
- C. Spray Nozzles: For foam water; include foam generator and distributing deflector to distribute foam or water.

2.6 MONITORING DEVICES

- A. Valve Supervisory Switches: Single pole, double throw, with normally closed contacts complying with UL 753. Switch shall signal fire-alarm panel or releasing panel when valve is in other than fully open position.
- B. Pressure Switches: Single pole, double throw, UL listed or FM Approved and complying with UL 753. Switch shall signal an alarm condition at the fire-alarm panel or releasing panel when switch is in other than fully open position.
- C. Flow Switches: Single pole, double throw, UL listed or FM Approved and complying with UL 753. Switch shall signal an alarm condition at the fire-alarm panel or releasing panel when switch is in other than fully open position.

2.7 ALARM DEVICES

Delete this article for wet- and dry-pipe, closed-sprinkler systems that are specified in Section 211313 "Wet-Pipe Sprinkler Systems," Section 211316 "Dry-Pipe Sprinkler Systems," Section 283111 "Digital, Addressable Fire-Alarm System," or Section 283112 "Zoned (DC Loop) Fire-Alarm System," which specifies actuation and monitoring devices for preaction and deluge system.

- A. Description: UL listed or FM Approved, low voltage, and surface mounting. Alarm and monitoring devices are specified in Section 283111 "Digital, Addressable Fire-Alarm System" or Section 283112 "Zoned (DC Loop) Fire-Alarm System."

PART 3 - EXECUTION

3.1 CONCENTRATE STORAGE TANK INSTALLATION

Retain "Equipment Mounting" Paragraph below for equipment supported on cast-in-place concrete equipment bases without vibration isolation devices.

- A. Equipment Mounting: Install concentrate storage tanks on cast-in-place concrete equipment bases. Comply with requirements for equipment bases specified in [Section 033000 "Cast-in-Place Concrete."] [Section 033053 "Miscellaneous Cast-in-Place Concrete."]
 - 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 - 2. Construct bases to withstand, without damage to equipment, seismic force required by code.
 - 3. Construct concrete bases [4 inches (100 mm)] [6 inches (150 mm)] [8 inches (200 mm)] <Insert dimension> high and extend base not less than 6 inches (150 mm) in all directions beyond the maximum dimensions of concentrate storage tank unless otherwise indicated or unless required for seismic anchor support.
 - 4. Minimum Compressive Strength: [5000 psi (34.5 MPa)] [4500 psi (31 MPa)] [4000 psi (27.6 MPa)] [3500 psi (24.1 MPa)] [3000 psi (20.7 MPa)] <Insert value> at 28 days.
 - 5. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.

6. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floor.
 7. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 8. Install anchor bolts to elevations required for proper attachment to supported equipment.
- B. Install concentrate storage tanks anchored to substrate according to tank manufacturer's written instructions.
- C. Install tanks level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

Retain option in paragraph below if Project is in seismically active area.

- D. [**Install seismic restraints for tanks.**] Anchor tanks to substrate.

3.2 PIPING INSTALLATION

- A. Install piping and other components level and plumb.
- B. Install pipe and fittings, valves, and discharge devices according to requirements listed in NFPA 16, "Installation of Foam-Water Sprinkler and Foam-Water Spray Systems."
1. Support piping using supports and methods according to NFPA 13.

Retain first subparagraph below if Project is in seismically active area.

2. Install seismic restraints for concentrate storage tanks and piping systems.
3. Install monitoring and alarm devices according to NFPA 16 and NFPA 72.

Retain applicable paragraphs below for threaded, grooved, or welded joining method.

- C. Install flanges, flange adapters, or couplings for grooved-end piping on piping, valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for foam concentrate. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

- H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
 - 1. Shop weld pipe joints where welded piping is indicated.
- K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems and with foam concentrate.

3.3 CONNECTIONS

Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in Section 211313 "Wet-Pipe Sprinkler Systems" or Section 211316 "Dry-Pipe Sprinkler Systems." If Drawings are explicit enough, these requirements may be reduced or omitted.

- A. Comply with requirements for piping specified in Section 211313 "Wet-Pipe Sprinkler Systems" or Section 211316 "Dry-Pipe Sprinkler Systems." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Provide concentrate control and drain valves with piping to permit maintenance of the foam concentrate with continuous sprinkler-system service.
- C. Install proportioning controller in fire-suppression piping to provide coverage to area indicated on Drawings.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Connect electrical devices to building's fire-alarm system. Comply with requirements for wiring and connections in Section 283111 "Digital, Addressable Fire-Alarm System" or Section 283112 "Zoned (DC Loop) Fire-Alarm System."
- F. Install a fire department connection on the supply side of the proportioning controller when required.

3.4 LABELING

- A. Install labeling on piping, equipment, and panels according to Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 CHARGING SYSTEM

- A. Fill proportioning tanks with foam concentrate after field quality-control testing is complete and satisfactory results have been achieved.

3.6 FIELD QUALITY CONTROL

- A. Inspection: Engage the services of a qualified professional engineer to inspect installed fire-extinguishing systems, prepare installation report, and certify that installation complies with the Contract Documents, calculations, and requirements of authorities having jurisdiction.
- B. Comply with operating instructions and procedures in NFPA 16, "Acceptance Tests" Chapter. Include the following tests and inspections to demonstrate compliance with requirements:
1. Check mechanical items.
 2. Inspect equipment and check mountings for adequate anchoring to substrate.
 3. Check electrical systems.
 4. Flush supply piping.
 5. Perform hydrostatic pressure test.
 6. Perform acceptance test.
 7. Perform proportioning system test.
 8. Perform discharge test.
 9. Flush system piping.
 10. Correct malfunctioning equipment; retest to demonstrate compliance. Replace equipment that cannot be satisfactorily corrected or does not perform as specified and indicated; retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.

Retain first paragraph below to require Contractor to perform tests and inspections.

- C. Perform tests and inspections.

Retain subparagraph below to require a factory-authorized service representative to assist Contractor with inspections, tests, and adjustments.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations including connections, and to assist in testing.

Retain first paragraph below to describe tests and inspections to be performed.

- D. Tests and Inspections:

1. After installing foam fire-extinguishing piping system and after electrical circuitry has been energized, test for compliance with requirements.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start systems to confirm proper unit operation.

4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

See Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
--

- E. Foam fire-extinguishing piping system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 211339